

1990 Warren Publishing, Inc., Communications Daily

Motorola doesn't plan to operate Iridium, Caile said. It plans to build system of satellites then turn it over to several regional consortia that actually will run network, although Motorola may take minority stake in some consortia. He said there's "pretty good chance" that International Telecommunication Union will agree on worldwide frequency band for Iridium. Original plan assumed that satellites would be "turned off" as they pass over countries that won't allow communication with them, Caile said, but that problem is diminishing as result of "Berlin Wall's coming down."

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LEVEL 1 - 28 OF 53 STORIES

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GANNETT NEWS SERVICE

August 13, 1990, Monday

SECTION: BUSINESS BUSINESS Q & A

LENGTH: 1161 words

KEYWORD: BIZQA

BODY:

Brace yourself. The age of Buck Rogers is upon us. We're rocketing full steam toward an era in which everyone will be born with a phone number - similar to a Social Security number - that's kept for life. Like it or not, your phone will go everywhere you go. And your conversations may go practically to anybody. The Internal Revenue Service already claims it can legally eavesdrop on cordless-phone conversations without a warrant. In short, there will be no place left to hide. "You'll be tracked when you have a phone down to a kilometer," says Larry McLernon, chairman of Litel Telecommunications.

QUESTION: How do '80s PCs compare to futuristic models?

A: In the '80s, personal computers freed people from large firms, letting them work almost anywhere, any time. This decade, powerful wireless "personal" phone services will let people instantly reach other people no matter where they are.

Q: What's in store for PC users?

A: Phones you can slip in a shirt pocket. They will relay calls via satellite to anywhere in the world. Theoretically, you could phone an Arab sheik on his camel in the Sahara from a horse-drawn carriage in New York's Central Park. Motorola Inc. already sells a pocket-size (12.3-ounce) cellular phone called "MicroTac." Two months ago, Motorola said it intends to launch Iridium, a network of 77 low-orbiting satellites that by 1996 will let people talk on pocket-size phones anywhere in the world.

Q: Any less-ambitious endeavor coming along?

A: In May, Millicom Inc. of New York City won government permission to test a pocket-size \$ 150 phones that share radio frequencies with electric power utilities. Millicom will start testing its technology next month in Orlando, Fla., and Houston. The Federal Communications Commission is expected to license the technology to telecommunications firms, including Millicom, in three to five years.

Q: What other gadgets are due?

A: Dick Tracy-style pagers: Several firms are introducing tiny wristwatch pagers that will receive messages like "call home" or "call office."

Motorola recently announced nationwide distribution of a tiny wristwatch pager that will receive short messages anywhere in the USA. Timex Inc., Motorola's partner in the venture, will have its pager watches in stores by next year. Tiny AT&E Corp. of San Francisco and Japanese watch giant Seiko are testing their

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1990 GANNETT NEWS SERVICE, August 13, 1990

wristwatch pagers in Portland, Ore., using a portion of the FM radio dial.

Q: What about the plane-to-plane calling?

A: It's already easy to call from an airborne jet - if you're flying over the continental USA. The next step is calling a plane from the ground or another plane. In-Flight Phone Corp. of Oak Brook, Ill., early next year plans to offer two-way phone service from jets allowing you to call a plane from a plane, with credit-card phones at each seat so that flight attendants don't have to answer calls for passengers. You'll also be able to plug your laptop PC into the phone to send and receive data. Other companies are developing phones that let people call jets from the ground.

Q: Is anything afoot to eliminate static in radio transmissions?

A: Soon, the annoying static and fade that plagues local radio broadcasts will be a memory. Compact disc-quality music - beamed via satellite from a national "superstation" - will hit a dish on the roof of your car. You'll be able to drive from New York to L.A. and listen to the same station. Entrepreneurs such as Peter Dolan of Satellite CD Radio Inc. in Washington recently asked the FCC for permission to test a nationwide radio "superstation" that would broadcast CD music to the entire USA.

Q: Why the rush to new super products?

A: As the 20th century closes, people want to be in constant touch. And they love to keep moving while they're talking. If you doubt that, just recall the 1980s mega-boom in cellular car phones and conventional cordless phones. In 1984, there were just 92,000 people using cellular phones. Five years later, there were 3.5 million cellular car phone users ringing up \$ 3.3 billion in calls a year. Only 9 percent of U.S. households had cordless phones in 1985; 26 percent of households have them now. "If technology and regulations will allow wireless communications, there's a tremendous unserved need out there," says Stuart Lipoff, a consultant with Arthur D. Little.

Q: Are there any drawbacks to these advances?

A: There are several barriers - financial as well as technical - to an era of "personal communicating." Cost is one of the stumbling blocks. Motorola's Iridium project hopes to attract 600,000 to 800,000 customers in its first five years of operation, but the phones will cost \$ 3,000 each, compared with an average cellular telephone price of \$ 400 to \$ 500. Also, there is no space on the airwaves. Hundreds of entrepreneurs have besieged the FCC asking for radio space to transmit everything from high-definition television to signals that can lock and unlock car doors from blocks away. "Our big question is, where do we put them?" says Tom Stanley, the FCC's chief engineer.

Q: Does politics play a part in these problems?

A: Yes. Even if the FCC could find radio space, it would have to bump some very powerful interests - like the Pentagon - off the air. Some in Congress want to take 200 megahertz of radio spectrum away from the military and give it to commercial market. The Pentagon and CIA, which use the radio space to transmit top-secret messages and for eavesdropping, refuse to go along. Innovative telecommunications projects before the FCC are disclosed in public, which

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gives away competitive secrets and invites copycat applications. That attracts even more competition and bogs down the FCC's cumbersome approval process.

Q: Who are our competitors?

A: Our strongest economic competitors, including Britain and Japan, are busy clearing space for the new phone services. The British already use \$ 200 pocket-size phones that can be carried from one part of a city to another. Other nations such as Japan are building so-called ''personal communications networks'' that let people keep their phone numbers for life. Even lesser-developed and communist countries could blow by the USA. Hungary and Poland have almost no phones now. But they're leaping directly into the wireless age by installing state-of-the-art cellular networks.

Q: Are any of these products already in operation?

A: Telular Inc. of Wilmette, Ill., sells a suitcase-size radio receiver that starts at \$ 440. The device converts ordinary phones or fax machines into portable models. Telular has delivered 1,000 units to Mexico City customers, enabling them to plug into the city's cellular phone network. That means you can plop down in the middle of a neighborhood and start phone service. Says William DeNicolo, Telular's president, ''We can now provide - almost overnight - communications to customers who've been waiting 15 years for a phone.''

SUBJECT: QUESTION AND ANSWER; TELEPHONE

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LEVEL 1 - 29 OF 53 STORIES

Copyright (c) 1990 Gannett Company Inc.
USA TODAY

August 13, 1990, Monday, FINAL EDITION

SECTION: MONEY

LENGTH: 1216 words

HEADLINE: The new wireless age;
Technology putting world in our pockets

BYLINE: John Schneidawind

BODY:

It's 1996. You're hiking through the middle of the Arizona desert. A wristwatch pager beeps you to call the office. So you pull out your pocket-size phone and call your secretary. The message: Your boss is flying into Phoenix. Get there fast.

So you hop into your Jeep and dash off. Not too fast, though. Tiny, low-orbiting satellites track your car and radio the highway patrol the second you break the speed limit. Besides, if you're really behind, you can always call your boss aboard the plane from a pay phone on the ground.

Brace yourself. The age of Buck Rogers is upon us. We're rocketing full steam toward an era in which everyone will be born with a phone number - similar to a Social Security number - that's kept for life.

Like it or not, your phone will go everywhere you go. And your conversations may go practically to anybody. The Internal Revenue Service already claims it can legally eavesdrop on cordless-phone conversations without a warrant.

In short, there will be no place left to hide. "You'll be tracked when you have a phone down to a kilometer," says Larry McLernon, chairman of Litel Telecommunications.

In the '80s, personal computers freed people from large firms, letting them work almost anywhere, any time. This decade, powerful wireless "personal" phone services will let people instantly reach other people no matter where they are. Here's what's just around the corner:

- Phones you can slip in a shirt pocket. They will relay calls via satellite anywhere in the world. Theoretically, you could phone an Arab sheik on his camel in the Sahara from a horse-drawn carriage in New York's Central Park.

Motorola Inc. already sells a pocket-size (12.3-ounce) cellular phone called "MicroTac." Two months ago, Motorola said it intends to launch Iridium, a network of 77 low-orbiting satellites that by 1996 will let people talk on pocket-size phones anywhere in the world.

In May, Millicom Inc. of New York City won government permission to test a less-ambitious project - pocket-size \$ 150 phones that share radio frequencies with electric power utilities. Millicom will start testing its technology next month in Orlando, Fla., and Houston. The Federal Communications Commission is

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expected to license the technology to telecommunications firms, including Millicom, in three to five years.

- Dick Tracy-style pagers: Several firms are introducing tiny wristwatch pagers that will receive messages like "call home" or "call office."

Status: Motorola recently announced nationwide distribution of a tiny wristwatch pager that will receive short messages anywhere in the USA. Timex Inc., Motorola's partner in the venture, will have its pager watches in stores by next year. Tiny AT&E Corp. of San Francisco and Japanese watch giant Seiko are testing their wristwatch pagers in Portland, Ore., using a portion of the FM radio dial.

- Plane-to-plane calling: It's already easy to call from an airborne jet - if you're flying over the continental USA. The next step is calling a plane from the ground or another plane.

Status: In-Flight Phone Corp. of Oak Brook, Ill., early next year plans to offer two-way phone service from jets allowing you to call a plane from a plane, with credit-card phones at each seat so that flight attendants don't have to answer calls for passengers. You'll also be able to plug your laptop PC into the phone to send and receive data. Other companies are developing phones that let people call jets from the ground.

- Super radio: Soon, the annoying static and fade that plagues local radio broadcasts will be a memory. Compact disc-quality music - beamed via satellite from a national "superstation" - will hit a dish on the roof of your car. You'll be able to drive from New York to L.A. and listen to the same station.

Status: Entrepreneurs such as Peter Dolan of Satellite CD Radio Inc. recently asked the FCC for permission to test a nationwide radio "superstation" that would broadcast CD music to the entire USA.

Why the rush to the age of CD radio and wireless phones? As the 20th century closes, people want to be in constant touch. And they love to keep moving while they're talking. If you doubt that, just recall the 1980s mega-boom in cellular car phones and conventional cordless phones.

In 1984, there were just 92,000 people using cellular phones. Five years later, there were 3.5 million cellular car phone users ringing up \$ 3.3 billion in calls a year. Only 9% of U.S. households had cordless phones in 1985; 26% of households have them now.

"If technology and regulations will allow wireless communications, there's a tremendous unserved need out there," says Stuart Lipoff, a consultant with Arthur D. Little.

But there are several barriers - financial as well as technical - to an era of "personal communicating." Among the stumbling blocks:

- Cost. Motorola's Iridium project hopes to attract 600,000 to 800,000 customers in its first five years of operation, but the phones will cost \$ 3,000 each, compared with an average cellular telephone price of \$ 400 to \$ 500.

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- No space on the airwaves. Hundreds of entrepreneurs have besieged the FCC asking for radio space to transmit everything from high-definition television to signals that can lock and unlock car doors from blocks away.

'Our big question is, where do we put them?' says Tom Stanley, the FCC's chief engineer.

Part of the problem is politics. Even if the FCC could find radio space, it would have to bump some very powerful interests - like the Pentagon - off the air. Some in Congress want to take 200 megahertz of radio spectrum away from the military and give it to commercial market. The Pentagon and CIA, which use the radio space to transmit top-secret messages and for eavesdropping, refuse to go along.

- Fear of tipping your hand. Innovative telecommunications projects before the FCC are disclosed in public, which gives away competitive secrets and invites copycat applications. That attracts even more competition and bogs down the FCC's cumbersome approval process.

If the USA wants to keep pace with the rest of the world, those problems must be solved fast. Our strongest economic competitors, including Britain and Japan, are busy clearing space for the new phone services. The British already use \$ 200 pocket-size phones that can be carried from one part of a city to another. Other nations such as Japan are building so-called 'personal communications networks' that let people keep their phone numbers for life.

Even lesser-developed and communist countries could blow by the USA. Hungary and Poland have almost no phones now. But they're leaping directly into the wireless age by installing state-of-the-art cellular networks.

Telular Inc. of Wilmette, Ill., sells a suitcase-size radio receiver that starts at \$ 440. The device converts ordinary phones or fax machines into portable models. Telular has delivered 1,000 units to Mexico City customers, enabling them to plug into the city's cellular phone network. That means you can plop down in the middle of a neighborhood and start phone service.

Says William DeNicolo, Telular's president, 'We can now provide - almost overnight - communications to customers who've been waiting 15 years for a phone.'

GRAPHIC: color, Marcia Staimer, USA TODAY (Drawing, Person holding cellular phone and pager)

TYPE: Cover Story

SUBJECT: TELEPHONE; ELECTRONICS; FUTURE

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LEVEL 1 - 30 OF 53 STORIES

Copyright 1990 Warren Publishing, Inc.
Communications Daily

August 8, 1990, Wednesday

SECTION: Vol. 10, No. 153; Pg. 6

LENGTH: 257 words

BODY:

Japan's Bcstg. Satellite 3a (BS-3a) has been scheduled for Aug. 24 launch, with backup window of Aug. 25-Sept. 30, National Space Agency of Japan said Tues. Satellite will be boosted on H-1 rocket from Osaki Launch Complex, Tanegashima Space Center. Bird is to take over broadcasting from BS-2.

Bulgaria is conducting satellite broadcasting experiments in 5 tourist complexes in Kazanluk and part of Mladost residential district, Sofia, according to report in Duma, Bulgarian newspaper. Report said broadcasts of satellite programs without "written agreement of its makers" is forbidden and violators will be prosecuted. Govt. reportedly also is negotiating with 20 foreign satellite TV organizations for satellite TV programming and other services. It said receiving equipment is to be financed partly through loans from England, France, Italy, W. Germany.

RTV Belgrade, Yugoslav TV station, plans to buy transponder on Intelsat satellite, said Ekonomska Politika, Yugoslav newspaper. Report said it will broadcast Yugoslav programs in Europe. Capacity is in addition to channel reserved on Astra satellite last year.

Essex Corp., Alexandria, Va., said it has been awarded \$1.2-million contract by Motorola to work on latter's Iridium satellite cellular system (CD June 29 p10). Essex said it began systems engineering in satellite and network control and development of network simulator in March. Under contract, work has been extended through Dec., and company said it expects additional involvement through at least 1991.

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LEVEL 1 - 31 OF 53 STORIES

Copyright 1990 The Washington Post
The Washington Post

August 7, 1990, Tuesday, Final Edition

SECTION: FINANCIAL; PAGE C1

LENGTH: 430 words

HEADLINE: Essex Reports Losses, Plans Layoffs;
Major Contract for Work on Trident Sub Coming to an End Soon

SERIES: Occasional

BYLINE: Sandra Sugawara, Washington Post Staff Writer

BODY:

Essex Corp., an Alexandria-based defense contractor, yesterday reported a loss of \$ 263,000 for the second quarter and announced that its major contract, involving work on the Trident submarine program, would largely end by Sept. 30.

The Trident work, which had been performed under subcontract to the Electric Boat division of General Dynamics Corp., accounted for approximately \$ 2.6 million, or 20 percent, of 1990 first-half revenue, and about \$ 5 million, or 17 percent, of annual revenue in 1989.

Essex's operations in Mechanicsburg, Pa., and Portsmouth, N.H., will be sharply reduced, resulting in the elimination of about 45 jobs, or about 15 percent of the company's total work force.

Essex, which specializes in training people to operate complex weapons, nuclear plants and other high-technology instruments, has been struggling through a massive reorganization launched two years ago after years of sluggish growth.

The second-quarter loss of \$ 263,000, compared with a profit of \$ 81,000 (6 cents a share) in the 1989 second quarter, reflected the problems associated with two major aspects of Essex's reorganization.

Efforts to expand into commercial markets to replace the Trident business, which had been expected to end, have not yet produced as much revenue as Trident did.

In addition, the acquisition of Systems Engineering and Development Corp., a Columbia, Md.-based information technology and signal processing company that was to be the cornerstone of the push into new commercial high-technology markets, has continued to drain resources from the company.

Excluding SEDC, the company would have reported second-quarter income of \$ 20,000 (1 cent), compared with \$ 132,000 (10 cents) in the second quarter of 1989.

"It has taken longer to bring SEDC up to profitability than we expected," said Essex Chairman Harry Letaw. However, Letaw said, SEDC was critical to winning a \$ 1.2 million contract from Motorola Inc. to perform work on

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The Washington Post, August 7, 1990

Motorola's recently announced Iridium satellite cellular communications system.

Revenue for the second quarter was \$ 6.4 million, compared with \$ 7.3 million in the 1989 second quarter.

A major factor in the decline in sales was the completion by the end of 1989 of Essex's work as subcontractor to Boeing Corp. on its Navy aircraft maintenance trainer work.

Essex reported a \$ 460,000 loss for the first half of 1990, versus earnings of \$ 110,000 (8 cents a share) for the first half of 1989.

Revenue for the first half totaled \$ 13.1 million, compared with \$ 13.6 million in the first half of 1989.

TYPE: NATIONAL NEWS

SUBJECT: SALES AND REVENUES; RETURN ON INVESTMENT; LAYOFFS / FIRINGS; BUSINESS MANAGEMENT

ORGANIZATION: ESSEX CORP.

LEVEL 1 - 32 OF 53 STORIES

PR Newswire

August 6, 1990, Monday

DISTRIBUTION: TO BUSINESS DESK

LENGTH: 206 words

HEADLINE: MOTOROLA AWARDS \$1.2 MILLION CONTRACT TO ESSEX CORPORATION

DATELINE: ALEXANDRIA, Va., Aug. 6

KEYWORD: ESSEX CORP, MOTOROLA \$1.2 MILLION CONTRACT

BODY:

ALEXANDRIA, Va., Aug. 6 /PRN/ -- Essex Corporation (NASDAQ-NMS: ESEX) announced today that it has been awarded a \$1.2 million contract by Motorola Inc. (NYSE: MOT) to perform previously announced work on Motorola's IRIDIUM satellite cellular communications system.

Essex began systems engineering in satellite and network control and development of the network simulator in March 1990. This work is expanded and extended through December 1990 under the terms of the definitive agreement. Essex expects additional work in 1991 and beyond.

Dr. Harry Letaw Jr., chairman and chief executive officer of the system design and manufacturing concern, stated: "Our relationship with Motorola on this venture clearly demonstrates the value of Essex capabilities in the commercial marketplace. This successful crossover to commercial products is an outgrowth of work previously performed for government customers."

Essex Corporation designs and manufactures systems and ultra-speed digital-optical processors and supplies products and support for aerospace, training, information, electronic and military systems.

CONTACT -- Harry Letaw Jr., chairman and CEO, Essex Corporation, 703-548-4500

LEVEL 1 - 33 OF 53 STORIES

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August 6, 1990, Monday, BC cycle

SECTION: Financial Report.

LENGTH: 60 words

HEADLINE: ESSEX AWARDED MOTOROLA CELLULAR SATELLITE CONTRACT

DATELINE: ALEXANDRIA, VA., AUG 6, REUTER

BODY:

Essex Corp <ESEX.O> said it received a 1.2 mln dlr contract from Motorola Inc <MOT. N> to perform work on Motorola's Iridium satellite cellular communications system.

Essex began systems engineering on the cellular system in March 1990. The work has been extended through December 1990, and Essex said it expects additional work in 1991 and beyond.

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LEVEL 1 - 34 OF 53 STORIES

Copyright 1990 Warren Publishing, Inc.
Communications Daily

August 3, 1990, Friday

SECTION: Vol. 10, No. 150; Pg. 9

LENGTH: 181 words

BODY:

Stanford Telecommunications, Santa Clara, Cal., has been awarded subcontract by Motorola to provide engineering support to Iridium satellite communications program (CD June 29 p10), amount undisclosed. Company said Thurs. it will participate in preliminary design phase of program, which eventually will make possible global cellular telephone communication using satellites, handsets and gateway earth stations. Stanford said it has designed and manufactured electronic telecommunications chips and computer systems for satellite ground terminals for U.S. and international space programs since 1973. It said it also may be involved in other Iridium subcontracts because it has worked with advanced signal processing and satellite communications.

PanAmSat said it's carrying 150 hours of coverage of Goodwill Games for Turner Bcstg. for undisclosed amount. Games are being transmitted to Caribbean and Central and S. America.

Correction: MCI International has signed contract with IDB International for satellite service between U.S. and Santiago, Chile (CD July 31 p4).

LEVEL 1 - 35 OF 53 STORIES

PR Newswire

August 2, 1990, Thursday

DISTRIBUTION: TO BUSINESS DESK AND TECHNOLOGY EDITOR

LENGTH: 245 words

HEADLINE: STANFORD TELECOM AWARDED SUBCONTRACT TO DEVELOP CANDIDATE CONCEPTS FOR MOTOROLA'S PROPOSED WORLDWIDE SATELLITE TELEPHONE SERVICE

DATELINE: SANTA CLARA, Calif., Aug. 2

KEYWORD: STANFORD TELECOM AWARDED MOTOROLA SUBCONTRACT

BODY:

SANTA CLARA, Calif., Aug. 2 /PRN/ -- Stanford Telecommunications Inc. (NASDAQ: STII) announces that it has been awarded a subcontract by Motorola Inc. (NYSE: MOT) to provide engineering support to Motorola's IRIDIUM Program. The objective of the IRIDIUM Program is to make worldwide cellular telephone communication possible using satellites, portable handsets, and gateway earth ground stations designed to interface with local telephone networks, as well as to compliment existing urban ground cellular networks.

Stanford Telecom expects to make a significant contribution to the preliminary design phase of the IRIDIUM Program. Stanford Telecom has been designing and manufacturing complex electronic VLSI telecommunications chips and computer systems for satellite ground terminals for U.S. and international Space Programs since 1973. The prospect for additional subcontracts is also possible given Stanford Telecom's recognized experience in advanced signal processing and satellite communications.

Stanford Telecom designs, manufactures and operates electronic systems primarily for space programs for Government and commercial customers. These systems provide a variety of functions including satellite navigation, communications, earth observation and tracking, telemetry and control for both fixed stations, as well as mobile and airborne users.

CONTACT -- Gary Wolf of Stanford Telecommunications, 408-748-1010

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LEVEL 1 - 36 OF 53 STORIES

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August, 1990

SECTION: Vol. 17; No. 8; Pg. 32

LENGTH: 735 words

HEADLINE: World mobile electronic village plans

BYLINE: Woollacott, Emma

BODY:

World mobile electronic village plans

Motorola has announced plans for a digital mobile communications system that, if successful, could make current schemes for DECT and GSM look provincial. Based on a 'constellation' of 77 mini-satellites in low orbit, the Iridium system could provide coverage of the whole globe. However, implementation, scheduled for 1996, faces massive financial and regulatory obstacles.

Analysts are nevertheless cautiously optimistic. John Pemberton, a mobile communications analyst at the US' Gartner Group, says: 'We think it's very do-able, and it's going to work.' He believes that the main problem may be the financing; while Motorola predicts the system will cost \$ 2.3 billion to implement, Pemberton thinks it may be more.

Motorola will supply all equipment for the system, which is designed to operate in the L-band, in the 1-2GHz region which is currently allocated for satellite mobile services. Pemberton believes the system may be very popular in Europe, because it will be compatible with the planned GSM.

The system would be operated by one or more international consortiums, whose members would have to hold operating licences for this spectrum. Spectrum being a valuable commodity, generally used to the full, Motorola's major hurdle could well be obtaining the necessary allocations for each country.

Motorola has already signed memorandums of understanding with three organisations to study the potential of the network. These are Inmarsat, licensed for satellite communications at sea, the American Mobile Satellite Corporation (AMSC) and Telesat Mobile Inc (TMI), licensed for satellite mobile in the US and Canada respectively.

Motorola is also discussing the venture with other potential partners including British Telecom and organisations in Australia, Hong Kong and Japan, and is looking for a total of four to six partners, each of which will be expected to contribute either financially or by providing spectrum. Preference will be given to organisations which already have operating licenses for the spectrum.

Inmarsat, AMSC and TMI already have the necessary spectrum allocation, and according to a Motorola spokesman have spare capacity available for the Iridium service.

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The network of satellites will orbit the earth at a height of 413 nautical miles, arranged in seven circular polar orbits, with 11 satellites per plane; this means that every point on the earth's surface will be in continuous line of sight with at least one of the satellites. The low orbit allows radio signals to be received by cellular phone antennas; rather than satellite dishes. The satellites themselves would switch and route calls.

Each satellite antenna will project 37 cells onto the earth's surface, each of which will provide coverage of an area 350 nautical miles in diameter. Frequencies will be reused from cell to cell. The system will be able to transmit data at 2400 baud as well as voice.

Iridium will link with the PSTN via a series of initially 20 gateways in participating countries which will store customer billing information and keep track of each user's location.

The system is not designed to compete with existing land based cellular, says Motorola, but is expected to be used in remote or sparsely populated areas. It will be a great deal more expensive than land based cellular.

Call charges will be set by the individual service providers in each country, but Motorola expects costs to be around \$ 2-3 per minute, with a monthly subscription charge of about \$ 100. Handsets will be considerably more expensive than ordinary cellular handsets, at around \$ 3400. However, according to a Motorola spokesman, the system should be able to break even financially within a year of operation at a subscriber level of around 400 000. Motorola plans to put two demonstration satellites into orbit in 1992, with implementation of the rest of the system starting in 1994. Full service could be available by 1996.

Two other US organisations, Orbital Science Inc and Starsys, have recently announced low orbit systems for remote monitoring and messaging, and other satellite mobile applications seem to be on the increase. According to Pemberton, AT&T is to take a stake in Geostar for a service which would cover the US with two geostationary satellites.

PHOTO : Iridium's 77 satellites are in seven polar orbital planes of 11 satellites each.

SUBJECT:
Mobile communication systems, product development; Cellular radio equipment industry, product development; Mobile satellites in telecommunication, product development

COMPANY:
Motorola Inc., product development; SIC: 4899; 4812; 3663

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LOAD-DATE-MDC: November 02, 1990

LEVEL 1 - 37 OF 53 STORIES

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Data Communications

August, 1990

SECTION: NEWSFRONT; Vol. 19, No. 10; Pg. 23

LENGTH: 226 words

HEADLINE: The Gods Must Be Crazy

BODY:

Does a Ukrainian peasant want a \$ 3,500 cellular phone? That question inevitably pops to mind when viewing the plans that Motorola Inc. (Schaumburg, Ill.) announced last month for a global satellite-based cellular phone network. Dubbed Iridium, the project would use 77 low-flying satellites and would begin service sometime around 1995. Unlike the recently announced low-orbit satellite proposals from Orbital Communications Corp. and Starsys Inc. (both of Washington, D.C.) that handle only data, Iridium will provide both voice and data links. Transmission speeds will be 4.8 kbit/s for voice links and 2.4 kbit/s for data, and phones for Iridium will cost \$ 3,500 each. Service providers that have signed with Motorola to explore Iridium-based possibilities include the International Maritime Satellite Organization (London), the American Mobil Satellite Corp. (Washington), and Telesat Mobile Inc. (Ottawa, Ontario, Canada). The whole project will cost \$ 2.4 billion, Motorola says. Market researcher Howard Hecht, a program director at the Gartner Group (Stamford, Conn.), says the only market for Iridium will be in Eastern Europe or in the Third World, since 90 percent of the United States and most of Western Europe have existing or planned terrestrial cellular systems. So does a Ukrainian peasant or a Mongolian shepherd want a \$ 3,500 phone?

LEVEL 1 - 38 OF 53 STORIES

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August, 1990

SECTION: Vol. 14; No. 8; Pg. 11

LENGTH: 536 words

HEADLINE: Motorola plans to marry satellite & cellular; Inks deal with Inmarsat, AMSC & TMI; American Mobile Satellite Corp., Telesat Mobile Inc

BODY:

Motorola Plans To Marry Satellite & Cellular;

Inks Deals With Inmarsat, AMSC & TMI

The merging of satellite and cellular technologies moved closer to reality as Motorola announced plans for a \$ 2.3 billion global communications system called Iridium.

Motorola also announced it has signed memoranda of understanding with three major satellite organizations to study jointly the potential of the Iridium system. The agreements are with London-based International Maritime Satellite Organization (Inmarsat), American Mobile Satellite Corp., Washington, D.C., and Canada's Telesat Mobile Inc. (TMI).

The planned system is a constellation of 77 lightweight, smart satellites in low-earth orbit -- 413 nautical miles -- networked together to provide continuous telecommunications coverage around the globe between all points on land, sea or up to 100 miles in the air. System designers also call for space-to-earth gateways via a cross-link network which interfaces with the public switched telephone network (PSTN).

The digital, satellite-based system would employ hand-held, cellular personal communications equipment, similar to Motorola's Dyna-Tac, with low profile antennas, or other transportable user units.

Motorola, which is putting up 20 percent of the estimated development cost (about \$ 400 million), says the system is best suited to low-density population areas, such as oceans, rural areas, or areas where personal telecommunication is just emerging. But Motorola claims, business and government sectors also are interested.

Motorola executives say they envision it would serve as the supplier of phones, and eventually satellites, but they also indicated the company may take a minority equity interest in the system.

The Iridium system, which would be operated by a consortia of licensees in the various countries it serves, is entirely digital with 8 KHz bandwidth for each voice channel and will also permit data transmission at 2,400 baud. When completed, it will operate in the 1 to 2 GHz range.

The 77-satellite constellation was planned so that every point on the earth's surface will be in line of sight of one or more satellites. The configuration

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includes 11 satellites in each of seven polar orbits. All satellites would travel in the same direction, co-rotating over the north pole and travelling down to the south pole.

The satellites will be about one-by-two meters in width and height and will weigh about 315 kilograms, or 700 lbs. Each antenna pattern will project 37 cells onto the surface of the earth and will cover a diameter of about 350 nautical miles of surface.

Iridium's satellites will operate crosslinks (as the medium to support internetting) which will operate at about 20 GHz and will have forward and backward looking links to the adjacent satellites in the same orbital plane -- nominally fixed at 2,173 nautical miles apart. Up to six interplane crosslinks will be included, varying in angle and at a maximum distance from the satellite of 2,500 nautical miles.

The operational plan is for a demonstration launch of two spacecraft in 1992. Implementation of the entire system is planned to begin in 1994, with full service scheduled for 1996.

SUBJECT:

International Maritime Satellite Organization, contracts; Mobile satellites in telecommunication, contracts

COMPANY:

Motorola Inc., contracts; American Mobile Satellite Corp., contracts; Telesat Mobile Inc., contracts; SIC: 4812; 3663

09245327

LOAD-DATE-MDC: September 21, 1990

LEVEL 1 - 39 OF 53 STORIES

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August, 1990

SECTION: Vol. 24; No. 8; Pg. 17

LENGTH: 852 words

HEADLINE: Motorola unveils global satellite-based cellular network; The Iridium system of 77 small satellites in low earth orbit Global News

BYLINE: Sharma, Paul; Valovic, Thomas S.

BODY:

Motorola Unveils Global Satellite-Based

Cellular Network

NEW YORK -- The cellular business may never be the same. Motorola has taken the wraps off of an ambitious scheme to circle the world with satellites that will form the basis for a global cellular "network" called Iridium. The system will be based on the deployment of 77 small satellites positioned in low earth orbits at an altitude of 413 nautical miles. (The system's name, Iridium, is derived from the fact that the element Iridium has 77 electrons.)

The positioning of the satellites, far below the customary geostationary orbit of 22,300 miles, will allow the system to offer two advantages. First, transmission power will be around one-thousandth of what is required to reach a geostationary satellite, which paves the way for the use of small-scale antennas rather than dishes for receiving and transmitting. This means that users can receive satellite calls directly via a small handset or the type of small antennas currently mounted on cars for cellular service. Secondly, since the satellites are not geostationary, Motorola can, to a certain extent, sidestep current regulatory procedures for satellite deployment and operation.

Each satellite will operate 37 cells which are approximately 360 nautical miles in diameter. Signals from the handset to the satellite operate at 1.5 GHz, are TDMA-coded, and use 8-kHz of bandwidth for voice. Data links will operate at 2400 baud. Once the satellite receives the signal, call verification and routing will be handled on earth via a "gateway station." Control signals from the satellite to a gateway will operate at 20 GHz, and there will be initially 20 gateways. The call can then be transferred from satellite-to-satellite, and then passed down to earth (see photo).

Motorola emphasizes that the system is designed to complement and not supplant existing and planned cellular networks for high-density areas, such as the GSM-based, pan-European digital cellular system. The system is designed to operate with a handset similar to Motorola's existing Dyna-Tac product. The intention is to equip the eventual handset with the capacity to conform to both local standards (such as GSM or PCN) and Iridium. However, since GSM and Iridium are both TDMA-based, some overlap in component functionality can be expected, claims Motorola.

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The total capacity of the Iridium system will be five million subscribers, and it will cost over \$ 2 billion to design and implement. Motorola, however, will leave this to what the company describes as "one or more international consortia whose members have the necessary licenses to operate in each country." So far, the company has signed agreements with Inmarsat, the American Mobile Satellite Corporation (AMSC), and Telestar Mobile to explore the potential of the system.

Reaction to the announcement from observers was mixed. While none questioned Iridium's technical feasibility, there were a number of concerns about cost and regulatory issues. "There is considerable opinion, particularly among the Europeans, that this system offers its principal advantages for outlying areas, including third world nations and remote/rural settings," noted Herschel Shosteck, president of Herschel Shosteck Associates (Silver Spring, MD). "However," he continued, "there are already viable satellite or terrestrial systems serving those areas in cost-effective ways, and at lower costs than Motorola reported."

Shosteck speculated that the Motorola announcement was a trial balloon, and possibly a spin-off from "a hush-hush sophisticated Department of Defense contract" at risk because of defense cutbacks. Other analysts offered a different view. "The \$ 2.1 billion cost of the project seems inflated and is considerably more than that associated with competing concepts," noted Ken Bosomworth, president of IRD. Bosomworth said he felt the company might be deliberately "keeping the cost-per-air minute way above the level you would normally associate with cellular or terrestrial long-distance communications" in order to avoid undercutting their own cellular business, and the cellular business in general.

The system is not expected to be deployed until 1996, said sources at Motorola. In the meantime, the company and its partners in the project will have to overcome some daunting technical and regulatory obstacles in advance of serious deployment. "Iridium throws up all sorts of regulatory and technical issues," noted Jeremy Rose, a consultant with London-based Communication Systems. "For example, it will be difficult to determine all the accounting arrangements between countries, and not all countries are signatories to satellite bodies."

Whatever the obstacles, Motorola's system will likely provoke an intense debate over the best means of developing global cellular systems. One analyst also suggested that the announcement will bring the satellite issue -- something which has caused concern in some quarters of the cellular industry -- "out into the open" and thus will have ultimately a beneficial effect.

GRAPHIC: chart; Caption: Signal transmission in Motorola's Iridium system

TYPE:
product announcement

SUBJECT:
Telecommunication systems, services; Artificial satellites in telecommunication, innovations; Cellular radio, services

COMPANY:
Motorola Inc., services; SIC: 3663; TICKER: MOT

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LOAD-DATE-MDC: October 5, 1990

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LEVEL 1 - 40 OF 53 STORIES

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Aviation Week and Space Technology

July 30, 1990

SECTION: NEW MISSION FOR LIGHT SATELLITES; Vol. 133, No. 5; Pg. 76

LENGTH: 1876 words

HEADLINE: Technology Spurs Lightsat Activity In Science, Commercial, Military Sectors

BYLINE: JAMES R. ASKER

DATELINE: WASHINGTON

BODY:

Recent advances in technology are spawning a flurry of activity in light satellites. Projects involving small spacecraft are helping to reinvigorate space sciences, nurture the embryonic commercial space sector and revolutionize military thinking about space.

While five years ago lightsats were the almost exclusive purview of amateurs and graduate students, many analysts now foresee a \$ 100-million annual market for lightsats within the decade. If even one of the proposals for large constellations of lightsats is realized, though, the sector will be much larger. Moreover, the fabrication of satellites would move for the first time from the realm of hand craftsmen to factory production lines.

A study completed in January for NASA found 36 corporations, universities and other organizations working seriously on lightsats. Another survey identified a potential for more than 300 space flights carrying small payloads through the year 2000.

Although lightsats still account for only a very small part of aerospace, the studies, by Lockheed Engineering and Sciences Co. and by Science Applications International Corp., concluded that the commercial lightsat industry is moving beyond infancy.

David Thompson, the president of Orbital Sciences Corp. (OSC), which is involved both in small launchers and satellites, likens the current situation to the early years of personal computers: proponents were confident a major new sector of an existing industry was in the offing, but since no one knew which applications would be deemed most attractive in the market, predicting the size of the business was difficult.

Some of the most visible work is being done by small companies, but most of the major satellite manufacturers are at least seriously studying the lightsat sector, according to USAF Lt. Col. Edward D. Nicastrì of the Defense Advanced Projects Research Agency (DARPA).

PEGASUS PLANS "Everybody has a small satellite they want to get in the system now," Nicastrì said. Some recent examples highlight the diversity:

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-- Building on its success with a lightsat launched this spring to explore Earth's magnetic field, a group at the Goddard Space Flight Center has NASA managers considering flying another Pegsat -- this time to release barium in view of the radio telescope in Arecibo, Puerto Rico. Engineers at Dryden Flight Research Center hope to use a Pegasus to boost a payload to an 18.5 deg. inclination.

-- Several industry officials are convinced there is a market for small geosynchronous communications satellites. One study identifies likely prospects for purchasing a single-transponder regional communications system as nations in the Andes Mountains, Pacific islands and Africa. -- Fairchild Space is offering a new lightsat bus for missions of one-three years in orbits of 200-700 km. Typical launch weight would be 100 kg. Pointing accuracy is within 0.1 deg. Solar arrays and batteries would provide an average 150 w.

A prime sales prospect for Fairchild's lightsat buses is likely to be Motorola's proposed Iridium network for global cellular telephone-type service (AW&ST July 2, p. 29). Few companies proposing to make lightsats can resist the prospects of supplying 77 satellites for a proposed \$ 2.3-billion project.

If realized, Iridium will move commercial satellite production, as one industry observer put it, 'out of the garage and into the factory.' Many lightsat developers expect one of the several proposed low-orbit communications networks, such as Iridium, Orbcomm, Starsys or digital radio, to be the project that spawns the first production line for satellites.

However, the proposal that would make the lightsat market into a truly large sector is Brilliant Pebbles, the constellation of small, agile and electronically advanced interceptors of the Strategic Defense Initiative (AW&ST Feb. 26, p. 62).

Fairchild's vice president for advanced development, Marc Sabin, calls the spacecraft 'the ultimate lightsat,' for the Brilliant Pebbles would be both highly advanced technically and numerous. The SDI Organization has said as many as 4,614 of the spacecraft might be procured. Ball Aerospace, Boeing, Martin Marietta, Raytheon, Rockwell International and TRW are working on concepts. Another SDI program, the Space Surveillance and Tracking Satellite (SSTS) effort, is also investigating lightsat approaches for a distributed network of satellites to track reentry vehicles and decoys.

ROLE OF MICROELECTRONICS At one time satellite designers had to think small because rockets had diminutive capabilities. But over the decades -- as launch vehicles grew -- capabilities of satellites expanded and confidence in and demands on space systems increased. The only direction seemed to be a relentless spiral toward bigger, more expensive spacecraft.

There are several reasons some have turned away from what Hughes Chairman Malcolm R. Currie calls spacecraft 'galacticas.'

Chief among the technical advances have been the increased capabilities of microelectronics and computers. Digital technology, data compression techniques and lasers for satellite-to-satellite links are playing roles in lightsat plans. Now ordinary personal computers serve as the heart of ground stations.

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Smaller spacecraft systems also play a pivotal role. Some examples of experimental systems that are expanding the horizons of lightsat possibilities:

-- Rocketdyne has tested a propulsion system of less than 3 kg., including attitude control thrusters and tanks, that achieves a rating of 600 newtons with its four tiny engines.

-- A new Honeywell ring laser gyroscope for inertial measurement is no wider than a quarter.

The expansion of U. S. space infrastructure has been critical as well. For example, many lightsat plans rely on data from Global Positioning System satellites. Perhaps most important has been the development of new, expendable vehicles and launch concepts geared for small payloads.

As a result there is also interest in lightsats as testbeds for advanced technology or for proving concepts. Fairchild's Sabin said, "You can do a quick verification of a commercial concept within the time frame of a business plan."

There were some who never lost faith in lightsats. For decades, the amateur radio community quietly built ever-more-capable communications satellites and hitched rides on launch vehicles with excess capacity. The University of Surrey, in England, launched four such satellites as secondary payloads on an Ariane. Other pioneers include Utah State and Weber State.

Scientists whose projects could not garner the large budgets necessary for major spacecraft mostly relied on experiments on sounding rockets. But now, according to Bob Pincus of NASA's Goddard Space Flight Center, there is a growing belief that much of the science that could be done on suborbital flights has been done, and longer duration missions are a must. In addition, there is deep concern among university scientists that talented students are no longer being drawn to space sciences and related fields because large-scale space projects take too long.

George Newton, NASA's deputy director of astrophysics, said a similar concern about difficulty in attracting new talent to the civil space agency was the prime impetus for the Small Explorer program. Starting in 1992, a series of three 400-500-lb. satellites will be launched. The spacecraft are budgeted at \$ 30 million a piece, excluding launch costs.

Two other NASA efforts have encouraged lightsat proponents. Although the dual-module, recoverable Comet, for Commercial Experiment Transporter, that the University of Tennessee Space Institute plans to launch in mid-1992 on a 30-day mission is, at 1,800 lb., heavier than what many consider a true lightsat, it demonstrates NASA's commitment to developing smaller spacecraft.

Mission to Planet Earth, a crash program NASA proposes to study the global environment, would build some of the largest, most complex scientific spacecraft yet, the Earth Observing System. But it also would include a series of medium-to-light satellites called Earth Probes.

Scientists at the Massachusetts Institute of Technology's Artificial Intelligence Laboratory who have been building micro-robots have even suggested using light spacecraft to send fleets of small rovers to explore the surface of Mars and other planets.

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